

## G21B

### FUSION REACTORS (uncontrolled reactors [G21J](#))

#### Definition statement

*This place covers:*

Reactors in which energy release is caused by the controlled fusion of atomic nuclei, namely:

Thermonuclear fusion reactors.

Low-temperature nuclear fusion reactors, e.g. alleged cold fusion reactors.

#### References

##### Limiting references

*This place does not cover:*

Uncontrollable fusion reactions; applications thereof	<a href="#">G21J</a>
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##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Controlled fission reactors	<a href="#">G21C</a>
Generating plasma; Handling plasma	<a href="#">H05H 1/00</a>

#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Confinement	Controlled compression of fusion nuclei to overcome their electrostatic repulsion.
Fusion	Combination of two or more nuclei to form a heavier nucleus, a by-product of which is the release of energy.
Thermonuclear	Relating to fusion at high temperatures.

## G21B 1/00

### Thermonuclear fusion reactors

#### Definition statement

*This place covers:*

systems and components for producing energy by nuclear fusion reactions taking place in a thermonuclear plasma, in particular all parts related to the confinement, ignition and sustainment of the plasma.

#### References

##### Limiting references

*This place does not cover:*

Low-temperature fusion systems	<a href="#">G21B 3/00</a>
Nuclear fission reactors	<a href="#">G21C</a>

Investigating plasma	<a href="#">H05H 1/00</a>
Generating plasma other than for nuclear fusion reactions	<a href="#">H05H 1/24</a> , <a href="#">H01J 37/32</a>

### Special rules of classification

The general rule of classification in this subclass follows the IPC rules, i.e. the invention information is classified with an EC class.

## G21B 1/01

### Hybrid fission-fusion nuclear reactors

#### Definition statement

*This place covers:*

Reactors composed of nuclear fusion systems combined with nuclear fission systems, whereby neutrons generated by the fusion reactions are used for generating nuclear fission reactions.

#### References

##### Limiting references

*This place does not cover:*

Nuclear fission reactors	<a href="#">G21C</a>
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## G21B 1/03

### with inertial plasma confinement

#### Definition statement

*This place covers:*

Reactors in which nuclear fusion reactions are initiated by heating and compressing a fuel target, typically in the form of a pellet containing the nuclear fuel.

#### References

##### Limiting references

*This place does not cover:*

Target compression by charged particle beam	<a href="#">G21B 1/23</a>
Target compression by laser	<a href="#">H05H 1/22</a>

## G21B 1/05

### with magnetic or electric plasma confinement

#### Definition statement

*This place covers:*

Reactors in which nuclear fusion reactions take place between atomic nuclei of a nuclear fuel in a plasma state, whereby magnetic fields are used to confine the plasma and electromagnetic fields are used to ignite and sustain the plasma.

## References

### Limiting references

*This place does not cover:*

Arrangements for confining plasma	<a href="#">H05H 1/02</a>
Closed loop vessels	<a href="#">H05H 1/12</a>
Straight vessels	<a href="#">H05H 1/14</a>

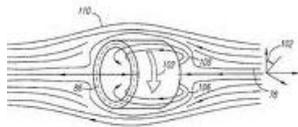
## G21B 1/052

**{reversed field configuration}**

### Definition statement

*This place covers:*

Reactors in which the plasma containment system comprises a chamber, a magnetic field generator for applying a magnetic field in a direction substantially along a principle axis, and an annular plasma layer that comprises a circulating beam of ions, wherein the internal magnetic field reverses direction.



## References

### Limiting references

*This place does not cover:*

Arrangements for confining plasma	<a href="#">H05H 1/02</a>
Straight vessels	<a href="#">H05H 1/14</a>

## G21B 1/055

### {Stellarators}

#### Definition statement

*This place covers:*

Closed-loop reactors in which the magnetic confinement is produced with a single coil system. As the helical twisting of field lines is achieved solely with external coils, the latter have to be twisted accordingly.



#### References

##### Limiting references

*This place does not cover:*

Arrangements for confining plasma	<a href="#">H05H 1/02</a>
Closed loop vessels	<a href="#">H05H 1/12</a>

#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Torsatron	Stellarator with continuous helical coils
Heliotron	Stellarator with added poloidal field coils
Heliac	Stellarator in which the magnetic field forms a toroidal helix
Helias	Helical Advanced Stellarator

## G21B 1/057

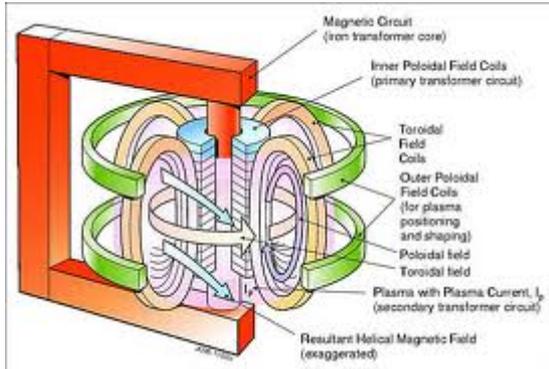
### {Tokamaks}

#### Definition statement

*This place covers:*

Closed-loop reactors using magnetic fields to confine the plasma in the shape of a torus with a doughnut cross-section. A toroidal magnetic field is generated by electromagnets encircling the torus.

A poloidal field is generated by a poloidal electric current that flows inside the plasma, this current being induced inside the plasma by a second set of electromagnets.



**References**

**Limiting references**

*This place does not cover:*

Arrangements for confining plasma	<a href="#">H05H 1/02</a>
Closed loop vessels	<a href="#">H05H 1/12</a>
Straight vessels	<a href="#">H05H 1/14</a>

**Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

First wall, blanket, divertor	<a href="#">G21B 1/13</a>
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**Synonyms and Keywords**

*In patent documents, the following abbreviations are often used:*

ITER	International Thermonuclear Reactor
JET	Joint European Torus
ASDEX	Axial Symmetric Divertor Experiment

**G21B 1/11**

**Details**

**Definition statement**

*This place covers:*

Specific components of the inertial and/or magnetic fusion confinement reactors and auxiliary systems associated, e.g. electromagnets.

**References**

**Limiting references**

*This place does not cover:*

Electrical components and details	<a href="#">G21B 1/21</a>
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Electromagnets in general	<a href="#">H01F 7/06</a>
Magnets for particle accelerators	<a href="#">H05H 7/04</a>

### **Informative references**

Attention is drawn to the following places, which may be of interest for search:

Targets for producing thermonuclear reactions	<a href="#">G21B 1/19</a>
Lasers for injection plasma heating	<a href="#">G21B 1/23</a>
Details of closed-loop containment structures	<a href="#">H05H 1/12</a>

## **G21B 1/115**

{Tritium recovery}

### **Definition statement**

*This place covers:*

Systems and methods for recovering the tritium generated in the blanket of a nuclear fusion reactor.

## **G21B 1/13**

**First wall; Blanket; Divertor**

### **Definition statement**

*This place covers:*

Details of the structural elements in contact with the plasma and/or affected by the fusion generated neutrons, and auxiliary systems associated, e.g. first wall cooling systems.

### **Glossary of terms**

*In this place, the following terms or expressions are used with the meaning indicated:*

FW	First wall
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## **G21B 1/15**

**Particle injectors for producing thermonuclear fusion reactions, e.g. pellet injectors**

### **Definition statement**

*This place covers:*

Systems and methods for injecting the nuclear fuel targets (e.g. pellets) into an inertial confinement reactor, and the nuclear fuel into the plasma in a magnetic confinement reactor.

### **References**

#### **Limiting references**

*This place does not cover:*

Lasers and related optical systems for producing plasma by target irradiation	<a href="#">G21B 1/23</a>
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## G21B 1/17

### Vacuum chambers; Vacuum systems

#### Definition statement

*This place covers:*

The reactor vessel in which the fusion reactions take place, and the auxiliary systems associated, e.g. systems for creating the desired pressure conditions within the vessel.

#### References

##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Closed loop vessels	<a href="#">H05H 1/12</a>
Straight vessels	<a href="#">H05H 1/14</a>

## G21B 1/19

### Targets for producing thermonuclear fusion reactions, e.g. pellets for irradiation by laser or charged particle beams

#### Definition statement

*This place covers:*

Targets containing the nuclear fuel apt to generate nuclear fusion reactions under compression, e.g. pellets for irradiation by laser or charged particle beams.

#### References

##### Limiting references

*This place does not cover:*

Targets for producing nuclear reactions	<a href="#">H05H 6/00</a>
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##### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Lasers for target irradiation	<a href="#">G21B 1/23</a>
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## G21B 1/21

### Electric power supply systems, e.g. for magnet systems, switching devices, storage devices, circuit arrangements {(methods or means for discharging superconducting storage windings [H01F 6/003](#))}

#### Definition statement

*This place covers:*

All the circuits and devices used in a nuclear fusion power plant for supplying energy to the plasma energizing systems.

## References

### Limiting references

*This place does not cover:*

Means for discharging superconducting storage windings	<a href="#">H01F 6/003</a>
Systems for supplying RF to particle accelerators	<a href="#">H05H 7/02</a>

## G21B 1/23

### Optical systems, e.g. for irradiating targets, for heating plasma or for plasma diagnostics

#### Definition statement

*This place covers:*

All the devices and systems used for irradiating fuel targets in an inertial confinement reactor (e.g. lasers), and the devices and systems using irradiation methods for measuring plasma parameters in nuclear fusion reactors.

## References

### Limiting references

*This place does not cover:*

Lasers in general	<a href="#">H01S</a>
Arrangements for investigating plasma in systems other than nuclear fusion reactors	<a href="#">H05H 1/00</a>

### Informative references

*Attention is drawn to the following places, which may be of interest for search:*

Arrangements for sustaining plasma by injection heating in laboratory systems	<a href="#">H05H 1/22</a>
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## G21B 1/25

### Maintenance, e.g. repair or remote inspection

#### Definition statement

*This place covers:*

Auxiliary equipments used for the construction, inspection, maintenance and repair of systems and components of nuclear fusion power plants.

## G21B 3/00

### Low temperature nuclear fusion reactors, e.g. alleged cold fusion reactors

#### Definition statement

*This place covers:*

Systems and components for producing energy by nuclear reactions not involving the generation of a thermonuclear plasma, e.g. fusion reactions.

#### References

##### Limiting references

*This place does not cover:*

Conversion of elements by electromagnetic or particle irradiation	<a href="#">G21G 1/00</a>
Radioactive sources	<a href="#">G21G 4/00</a>

#### Glossary of terms

*In this place, the following terms or expressions are used with the meaning indicated:*

Cold fusion	Nuclear (fusion) reactions taking place at ordinary temperatures
Thermonuclear fusion	Nuclear fusion reactions involving the generation of a plasma at extremely high temperatures(i.e. million degrees)

## G21B 3/002

### {Fusion by absorption in a matrix}

#### Definition statement

*This place covers:*

Systems and methods for inducing fusion of hydrogen isotopes by diffusion in a host matrix, or reactions of hydrogen isotopes with the nuclei of a host matrix at ordinary temperatures.

## G21B 3/004

### {Catalyzed fusion, e.g. muon-catalyzed fusion}

#### Definition statement

*This place covers:*

Systems and methods for inducing fusion of hydrogen isotope nuclei by using the catalyzing properties of muons in a hydrogen isotope environment.

**G21B 3/006**

**{Fusion by impact, e.g. cluster/beam interaction, ion beam collisions, impact on a target}**

**Definition statement**

*This place covers:*

Systems and methods for promoting nuclear fusion at ordinary temperatures using a beam of particles reacting with other particles or with a target.

**References****Limiting references**

*This place does not cover:*

Conversion of elements by electromagnetic or particle irradiation	<a href="#">G21G 1/00</a>
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**G21B 3/008**

**{Fusion by pressure waves}**

**Definition statement**

*This place covers:*

Systems and methods for promoting nuclear fusion of a (gaseous, liquid or solid) target by subjecting it to pressure or shock waves.

**References****Informative references**

*Attention is drawn to the following places, which may be of interest for search:*

Sonoluminescence	<a href="#">H05H 1/2475</a>
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